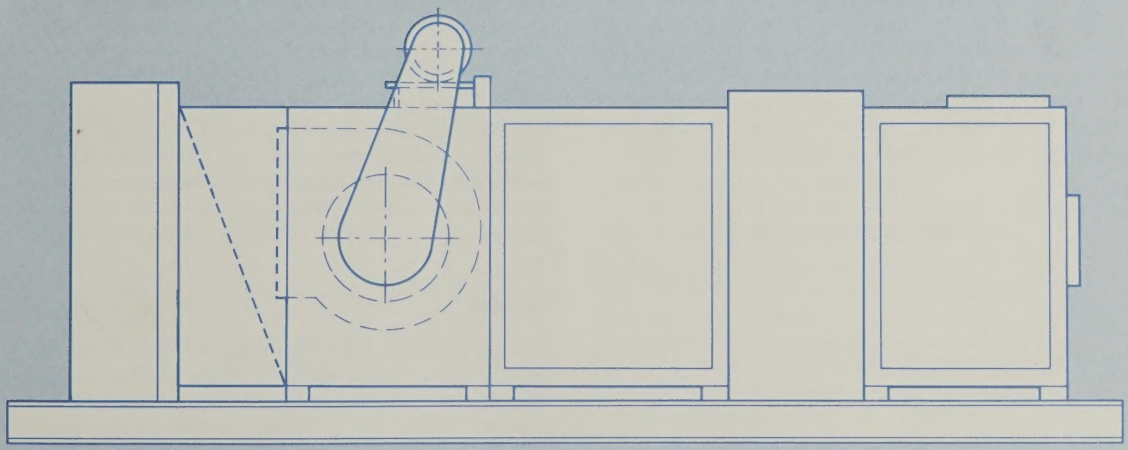
BULLETIN NO. RX100

The RX Packaged Hospital Air Handling Unit



American Air Filter COMPANY, INC.
215 Central Avenue, Louisville, Kentucky 40201

Public Health Service Standards ①

VENTILATION RECOMMENDATIONS

Hospital air conditioning systems can be designed to produce an aseptic environment. Four key elements in achieving this goal are:

1. High efficiency air filtration
2. Adequate ventilation rates
3. Proper air distribution
4. Temperature and humidity control

Although air filters are normally rated on their ability to remove atmospheric dust, numerous tests have been performed on bacteria. The results of these tests clearly show that air filtration is a highly efficient means of microbiological contamination control.

Minimum standards for hospitals receiving federal funds have been established by the Public Health Service. These include filter efficiencies, ventilation rates, humidity levels, pressure relationships and design temperatures. It is to be noted, however, that these are absolute minimums and do not constitute design recommendations. Public Health Service also lists guidelines with higher levels of filter efficiencies and air volumes. Another source of design recommendations is ASHRAE GUIDE AND DATA BOOK.

MINIMUM STANDARDS

Hospital Area	% Filter Efficiency*	Air Changes Per Hour	Temp. °F	% Relative Humidity	Relative Room Press.
Operating Room	90 NBS	12	70-76	50-60	Positive
Delivery Room	90 NBS	12	70-76	50-60	Positive
Recovery Room	90 NBS	6	75	50-60	Equal
Nursery	90 NBS	12	75	50	Positive
Isolation Room	90 NBS	6	75	—	Equal
Intensive Care	90 NBS	6	70-80	30-60	Positive
Patient Room**	90 NBS	2	75	—	Equal
Other Occupied Areas**	80 NBS	—	75	—	—
Exhaust Hoods***	99 DOP	—	—	—	Negative
Lab. Media Transfer	90 NBS	4	75	—	Positive

NOTES:

*Efficiencies are based on the National Bureau of Standards Test Method on atmospheric dust (NBS) or the Di-Octyl-Phthalate Test Method (DOP).

**With central recirculation.

***Handling infectious or high radioactive materials.

OUTDOOR AIR INTAKES

Outdoor air intakes should be located as high above ground level as possible. Minimum standards of the Public Health Service require the bottom of the intake to be a minimum of eight feet above ground level or if through the roof, a minimum of three feet above roof level. The Public Health Service also requires that the air inlet be not less than 25 feet from the exhausts from any ventilating system or combustion equipment, preferably as far away as practical.

ROOM SUPPLY AND EXHAUST

Room supply inlets should be located at or near ceiling heights. Minimum PHS standards require at least two exhaust outlets not less than three inches above the floor in sensitive areas. ASHRAE recommends that the air supply to ultra-clean or to highly contaminated areas be introduced through supply inlets in the ceiling and exhausted through several outlets near the floor. In general it is desirable to maintain a good ceiling to floor downward air flow, which coupled with adequate air quantities will approximate a piston effect.

FILTERS

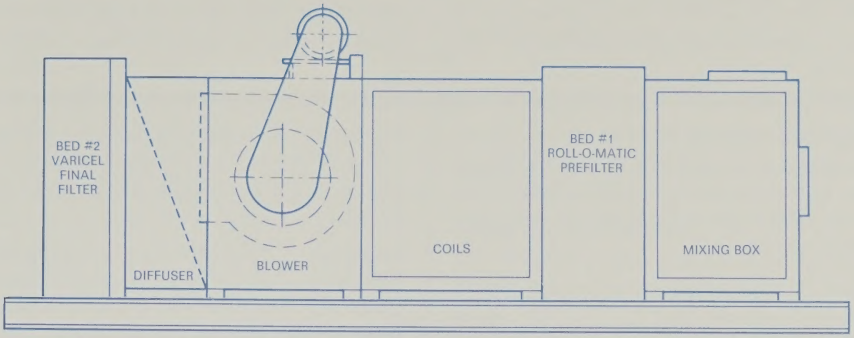
The ventilation systems serving sensitive areas such as operating rooms, delivery rooms, nurseries, isolation rooms, and laboratory sterile rooms, and recirculated central air systems serving other hospital areas, shall be equipped with a minimum of 2 filter beds. Filter bed #1 shall be located upstream of the conditioning equipment and shall have a minimum efficiency of 75 percent (Cottrell Dust Spot). Filter bed #2 shall be located downstream of the conditioning equipment and shall have a minimum efficiency of 90 percent (atmospheric).

A manometer shall be installed across each filter bed serving central air systems.

REFERENCES

① General Standards of Construction and Equipment for Hospital and Medical Facilities, Public Health Service Publication No. 930-A-7 Revised February 1969.

Available In Two Arrangements To Meet Your Size Requirements



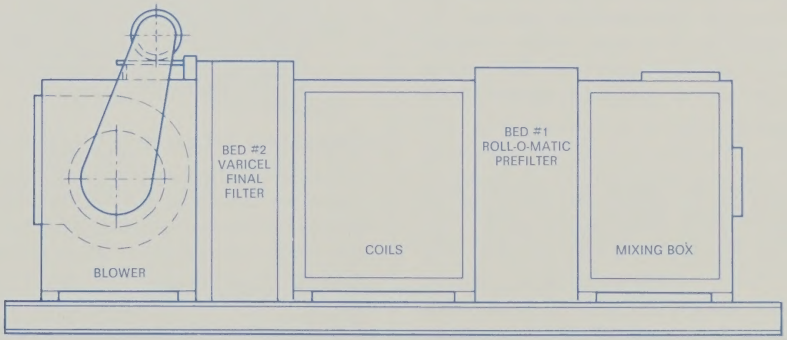
STANDARD ARRANGEMENT

The packaged RX unit is furnished completely assembled as shown for the standard arrangement. This unique arrangement of components delivers ultra clean air wherever it is needed, even critical areas such as nurseries, delivery or operating rooms, etc.

The filter arrangement, one being located upstream of the conditioning equipment, the other downstream meets all the requirements of the Hill-Burton Program.

The arrangement starting with the mixing box allows for the introduction of metered quantities of outdoor and return air. Then the air passes through the filter bed #1 where our AAF Roll-O-Matic filter operating at 85% efficiency (Cottrell Dust Spot) precleans the air. Next the air enters the coil section which can be fitted with cooling and heating coils of several types to meet the exacting requirements of the system design. From here the prefiltered and conditioned air passes through the fans into the diffuser section. From this point, the air is filtered across the final bed #2 filter. This final filter is an AAF Varicel which delivers clean air at 90-95% efficiency (NBS atmospheric).

For more complete and Specific Information on Air Handling Units, see Bulletin AH600.



COMPACT ARRANGEMENT

The packaged RX unit is also available in a compact arrangement as shown above. This unit like the standard arrangement is shipped completely assembled.

The filter arrangement differs in that the final filter is upstream of the blower section. Even so the upstream-downstream arrangement of filter beds 1 and 2 meet the requirements of the Hill-Burton Program.

With the compact arrangement, the assembled length of the RX unit is 2′ shorter than the standard arrangement. Thus, if space is critical as it can be due to building design, use the compact arrangement. This arrangement affords you all the ultra clean conditioned air needs just the same as the standard arrangement.

A complete air conditioning,

Shipped fully assembled, in one piece, for ease of installation.

Steam or hot water preheat/reheat coils.

Chilled water or direct expansion cooling and dehumidifying coils.

Unit casing insulated with glass fiber insulation meeting NFPA code 90A and erosion test UL 181.

Low speed forward curved fans for quiet operation.

PENTA-POST FRAME CONSTRUCTION

Five angle corner post, welded construction of heavy gauge steel for maximum strength and stiffness with minimum weight. Makes possible flush mounted service and access panels.

Casing Panels — Enclosure panels are fabricated of heavy gauge steel, flush mounted into the unit framework. Coil sections are furnished with extended panels.

PENTA-POST AND PANEL CONSTRUCTION

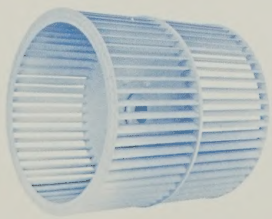
CABINET FINISH

Standard Paint — All cabinet parts are prepared for painting with a five-stage phosphatizing process, followed by coating with baked enamel primer containing rust inhibitors, and then baked at 325°. After assembly, the entire unit is sprayed with soft white air dry enamel.

FAN SECTION

Fan Housings — Each fan wheel is enclosed in a heavy gauge painted steel housing with adjustable cut-off. Die formed air inlets smooth air flow and reduce sound level.

Fan Wheels — Fan wheels are painted steel, slow speed, forward-curved type, statically and dynamically balanced and tested after being installed in the assembled unit.



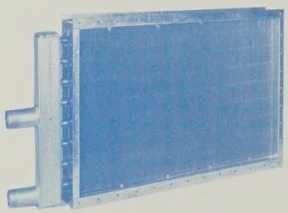
FAN WHEEL
Slow Speed
Forward Curved

Fan Shafts — Shafts are cold finished, turned, ground and polished solid steel, sized so that the first critical speed is at least 25% greater than operating fan-speed.

Bearings — Fan bearings are ball, self-aligning cast iron, pillow block type on these medium pressure units. The bearings are sized to provide an average bearing life in excess of 200,000 hours. External grease fittings are located for convenient lubrication.

STEAM DISTRIBUTING COILS—TYPE DT

Type DT coils are one row with 1" O.D. condensing tube and 5/8" O.D. steam distributing tube. Fin spacings of 4, 8, or 12 fins per inch. Scientifically oriented orifices and tubes pitched toward condensate return provide rapid condensate removal, even distribution of steam and uniform leaving air temperature to the entire coil face. Freeze-up protection is maintained even with modulation of steam. Available with same end or opposite end connections.



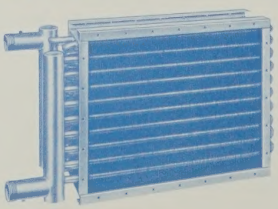
STEAM DISTRIBUTING

STANDARD STEAM COILS—TYPE S

All standard steam coils are furnished with 5/8" O.D. tubing. Fin spacings of 11 fins per inch are furnished. Supply and return tappings may be located on opposite ends of the coils or same end as specified.

WATER COILS—TYPE W

Water coils have 5/8" O.D. tubing. Inlet and outlet tappings are steel MPT sized for each coil. Supply and return tappings are equipped with 1/4" MPT plugs for field installation of vents and drains.



STANDARD WATER

heating and ventilating package.

Gasketed panels to minimize air leakage.

Mixing box for introducing metered quantities of outdoor air.

Fan and Roll-O-Matic motors wired to common electrical control box.

Units are all painted with soft white air dry enamel.

Blower section fans statically and dynamically balanced and tested at rated speed after being installed in the factory assembled unit.

DIRECT EXPANSION COILS—TYPE DE

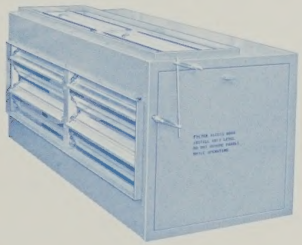
DE coils have 5/8" O.D. tubing.

Refrigerant circuiting is custom selected to the job specification. Therefore, it is highly desirable to have the thermal valve and distributor furnished as integral parts of the coil to insure maximum performance.

After testing, the coils are thoroughly dehydrated in a 250°F. oven under a vacuum well below 1,000 microns.

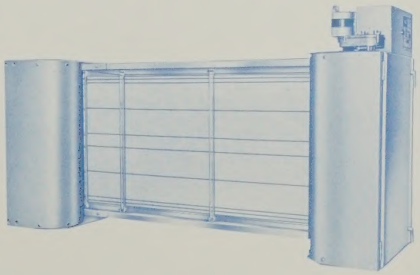
MIXING BOXES BLEND FRESH AND RECIRCULATED AIR

Inter-connected opposed acting damper sections are operated by an externally mounted damper motor (furnished and installed by others). Dampers and the unitary framework are fabricated from painted steel. Inlet openings are flanged.



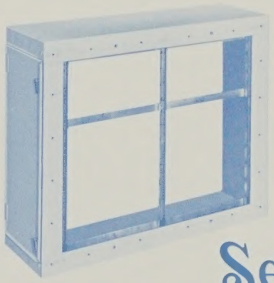
PREFILTER TYPE H Roll-O-MATIC

The AAF Type H Roll-O-Matic is an automatic renewable media air filter specifically designed for use with central station air handling units. It features Roll-O-Mat Media which provides an air cleaning efficiency of 85% by the NBS Dust Spot Test Method on Cottrell Dust. (Exceeds 75% minimum required for Hill-Burton Hospitals.) For complete information, see Bulletin 248.



FINAL FILTER HOUSING

The ServiSide side access filter housing is specifically designed to seal high efficiency cartridge filters. It utilizes features such as 3/4" rubber gasketing and the continuous pressure of the "over center" cam locking mechanism to insure leak proof service throughout the life of the Varicel filter cartridge. For complete information, see Bulletin 192.

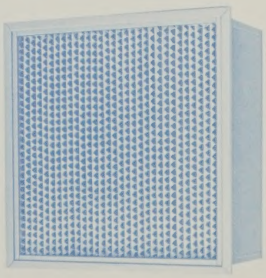


ServiSide

FINAL FILTER

The AAF Varicel is a high efficiency replaceable cartridge type filter. It offers the advantages of minimum depth and rigid construction and an air cleaning efficiency of 90-95% by the NBS Dust Spot Test Method on Atmospheric Dust. (Exceeds 90% minimum Hill-Burton requirements.) For complete information, see Bulletin 221.

Varicel



SPECIFICATIONS

Unit Size	FAN DATA			COIL DATA		FILTER DATA	
	Air Volume (CFM)	Outlet Velocity (FPM)	Quantity Fans, Fan Diameter, Outlet Area	Face Dimensions and Face Area	Face Velocity (FPM)	Bed #1 - Prefilter Roll-O-Matic Model No.	Bed #2 - Final Filter ServiSide Model No.
4	2000	2080	1 - 10" Dia. F.C. .96 Sq. Ft.	18" x 40" 5.0 Sq. Ft.	400	25-38	3H24 1 - 20"x24" Varicel
9	5000	2340	1 - 15" Dia. F.C. 2.14 Sq. Ft.	27" x 46" 8.63 Sq. Ft.	580	33-50	4H34 2 - 20"x24" Varicels 2 - 12"x24" Varicels
15	7500	1760	2 - 15" Dia. F.C. 4.27 Sq. Ft.	27" x 80" 15.0 Sq. Ft.	500	33-70	7H34 3 - 20"x24" Varicels 3 - 12"x24" Varicels
18	10000	1840	1 - 20" Dia. F.C. 5.45 Sq. Ft.	42" x 60" 17.5 Sq. Ft.	570	45-54	5H48 4 - 24"x24" Varicels 2 - 12"x24" Varicels
22	12000	1790	1 - 22" Dia. F.C. 6.69 Sq. Ft.	42" x 74" 21.6 Sq. Ft.	555	45-70	6H48 6 - 24"x24" Varicels
25	15000	2240	1 - 22" Dia. F.C. 6.69 Sq. Ft.	45" x 80" 25.0 Sq. Ft.	600	45-78	7H48 6 - 24"x24" Varicels 2 - 12"x24" Varicels

FAN RPM & MOTOR HORSEPOWER② DATA

Unit Size	CFM	TOTAL STATIC PRESSURE①																			
		2.50		2.75		3.00		3.25		3.50		3.75		4.00		4.25		4.50		4.75		5.00	
		RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP
4	2000	1500	1½	1566	2	1634	2	1700	2	1762	2	1830	3	1898	3	1962	3	2025	3	2088	3	2147	3
9	5000	1000	5	1050	5	1100	5	1150	5	1200	5	1220	5	1285	7½	1320	7½	1360	7½	1390	7½	1435	7½
15	7500	1015	5	1073	5	1113	7½	1162	7½	1205	7½	1249	7½	1298	7½	1353	10	1390	10	1419	10	1457	10
18	10000	780	7½	815	7½	845	10	877	10	910	10	935	10	975	15	1000	15	1030	15	1065	15	1100	15
22	12000	720	10	750	10	775	15	805	15	835	15	870	15	890	15	915	15	942	15	970	20	1000	20
25	15000	733	15	761	15	792	15	817	15	844	15	872	15	903	20	924	20	947	20	983	20	995	20

① Based on the External Static Pressure plus Internal Resistance of 1.3" plus the Coil(s) Resistance i.e. ESP of 1.16" + Internal of 1.3" + Coils of 1.04" = 3.50" TSP.

② Nominal horsepower shown. If interpolation is used between two Static Pressures, always use the largest horsepower shown.

COIL RESISTANCE — Inches of Water

Unit Size	Preheat or Reheat St'd. Steam or Hot Water		Preheat or Reheat One Row Steam Distributing			Cooling Coil 11 FPI		
	1 Row - 11 FPI	2 Row - 11 FPI	4 FPI	8 FPI	12 FPI	4 Row	6 Row	8 Row
4	.10	.16	.06	.10	.13	.48	.72	.96
9	.20	.31	.12	.19	.25	.84	1.26	1.68
15	.15	.24	.09	.14	.19	.68	1.02	1.36
18	.20	.31	.12	.19	.25	.84	1.26	1.68
22	.18	.29	.11	.17	.23	.76	1.14	1.52
25	.21	.33	.13	.20	.26	.90	1.35	1.80

TYPE W CHILLED WATER COOLING COIL CAPACITY①

Unit Information	Water Velocity (fps)	GPM	4 ROW - 11 FPI				6 ROW - 11 FPI				8 ROW - 11 FPI			
			MBH		Lvg. Air °F DB/WB	Water P.D. FT/HD	MBH		Lvg. Air °F DB/WB	Water P.D. FT/HD	MBH		Lvg. Air °F DB/WB	Water P.D. FT/HD
			Total	Sensible			Total	Sensible			Total	Sensible		
Size 4	2	40.9	92.2	60.3	52.4/51.9	.8	111.4	69.6	48.2/48.1	1.0	123.9	75.5	45.5/45.4	1.1
	4	81.8	107.3	67.0	49.4/48.9	2.7	125.3	76.1	45.2/45.1	3.4	135.3	81.1	42.9/42.9	4.0
CFM 2000	6	122.8	113.5	69.8	48.1/47.6	5.6	130.4	78.5	44.1/44.0	7.0	139.0	82.9	42.1/42.1	8.3
Size 9	2	61.4	184.9	130.2	56.2/55.3	.8	233.3	153.7	51.9/51.7	1.0	267.0	169.1	49.1/49.0	1.2
	4	122.8	227.9	148.3	52.9/52.1	2.9	277.1	172.8	48.4/48.2	3.6	309.1	188.4	45.5/45.5	4.3
CFM 5000	6	184.1	247.1	156.6	51.4/50.6	5.9	295.6	181.3	46.8/46.7	7.5	325.0	196.0	44.1/44.1	9.0
Size 15	2	61.4	286.9	200.5	55.5/54.8	1.1	351.5	231.5	51.8/51.6	1.4	403.0	254.8	48.9/48.9	1.7
	4	122.8	351.8	227.7	52.2/51.6	3.8	423.9	263.3	47.9/47.7	5.0	468.6	285.1	45.2/45.2	6.1
CFM 7500	6	184.1	382.7	241.0	50.6/50.0	7.9	454.2	277.5	46.2/46.0	10.4	494.6	297.6	43.7/43.7	12.9
Size 18	2	95.5	362.8	258.2	56.4/55.5	.9	456.2	303.0	52.3/52.1	1.2	519.7	331.8	49.7/49.6	1.4
	4	191.0	454.0	295.9	52.9/52.1	3.2	548.7	343.0	48.6/48.4	4.2	612.2	374.0	45.8/45.7	5.1
CFM 10000	6	286.4	494.1	313.2	51.4/50.6	6.7	588.3	361.3	47.0/46.8	8.7	647.0	390.6	44.3/44.2	10.6
Size 22	2	95.5	431.5	308.6	56.5/55.6	1.0	538.6	360.1	52.6/52.3	1.3	620.7	396.9	49.8/49.7	1.6
	4	191.0	538.0	352.6	53.1/52.4	3.6	655.4	410.4	48.7/48.5	4.7	730.3	446.8	46.0/45.9	5.8
CFM 12000	6	286.4	588.4	373.9	51.5/50.7	7.5	705.4	433.4	47.0/46.8	9.9	774.9	468.1	44.3/44.3	12.2
Size 25	2	102.3	512.2	373.9	57.2/56.3	1.1	637.2	434.7	53.5/53.2	1.4	738.1	480.0	50.7/50.7	1.7
	4	204.6	642.9	426.9	54.0/53.1	3.8	788.5	499.0	49.6/49.4	4.9	882.8	544.1	46.8/46.8	6.1
CFM 15000	6	306.9	708.1	454.6	52.3/51.5	7.9	855.6	529.4	47.7/47.5	10.4	946.0	574.1	45.0/44.9	12.9

① ARI Certified Ratings based on Entering Air Temperature of 80° DB/67° WB, Entering Water Temperature of 40° and Double Serpentine Circuiting. For ratings on other conditions, refer to Bulletin No. CC101.

PREHEAT COIL CAPACITY BASED ON 0°F ENTERING AIR AND 5 PSIG STEAM

Unit Size	CFM	Coil Face Velocity	One Row Type S 11 FPI		Two Row Type S 11 FPI		One Row Type DT 4 FPI		One Row Type DT 8 FPI		One Row Type DT 12 FPI	
			Final Temp.	MBH	Final Temp.	MBH	Final Temp.	MBH	Final Temp.	MBH	Final Temp.	MBH
4	2000	400	71	154	117	254	44	95	77	167	97	210
9	5000	580	60	325	101	548	37	201	61	331	78	424
15	7500	500	64	520	109	882	40	325	67	544	85	690
18	10000	570	61	660	103	1120	37	400	63	680	78	842
22	12000	555	63	820	104	1365	38	494	64	830	81	1050
25	15000	600	58	940	100	1628	36	585	60	975	77	1258

For other Entering Air Temperatures and Steam Pressures, multiply above Final Temperatures and MBH Rating by Correction Factors shown below:

PREHEAT COIL CORRECTION FACTORS

Entering Air Temp. °F	Steam Pressure (PSIG)						
	0	2	5	10	15	20	25
—30	1.07	1.10	1.13	1.19	1.23	1.27	1.31
—20	1.02	1.05	1.09	1.14	1.19	1.23	1.27
—10	.99	1.01	1.04	1.10	1.14	1.18	1.21
0	.93	.96	1.00	1.05	1.10	1.14	1.17
10	.89	.92	.96	1.01	1.06	1.10	1.13
20	.85	.87	.91	.97	1.01	1.05	1.08
30	.80	.83	.87	.92	.97	1.01	1.04
40	.76	.79	.82	.88	.92	.96	.99
50	.71	.74	.78	.83	.88	.92	.95
60	.67	.70	.74	.79	.84	.88	.91

WEIGHTS

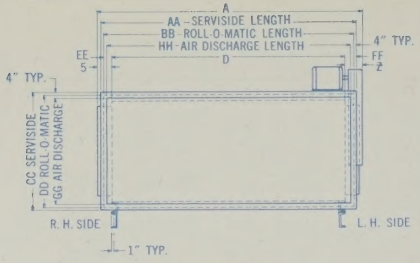
Unit Size	4	9	15	18	22	25
Standard Arrangement (Less Coils & Motor)	1265	1790	2535	2930	3340	3700
Compact Arrangement (Less Coils & Motor)	1160	1655	2285	2700	3090	3530
COOLING COILS						
4 Row - 11 FPI	100	160	320	340	495	600
6 Row - 11 FPI	150	225	480	500	720	850
8 Row - 11 FPI	195	300	635	660	840	980
HEATING COILS						
St'd. Steam or Water						
1 Row - 11 FPI	40	65	95	120	150	180
2 Row - 11 FPI	70	100	155	200	240	270
Steam Distributing						
4 FPI	55	80	120	160	190	210
8 FPI	60	90	140	180	220	240
12 FPI	65	100	160	200	250	270

MOTORS	1½HP	2HP	3HP	5HP	7½HP	10HP	15HP	20HP
Open Drip-proof	35	35	58	69	114	140	187	213
Totally Enclosed	35	35	58	69	136	169	252	302

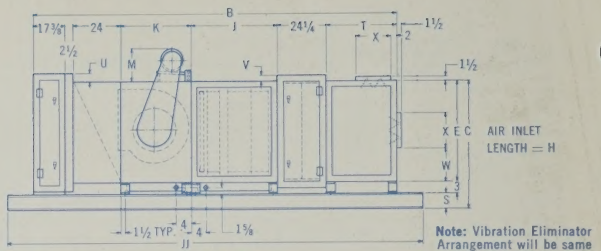
NOTE: All Coil Weights based on Aluminum Fins. For Copper Fins, refer to Cooling Coil Bulletin No. CC101 or Heating Coil Bulletin No. HC103 for additional weight factors.

Dimensions

STANDARD ARRANGEMENT



FRONT VIEW



SIDE ELEVATION

Note: Vibration Eliminator Arrangement will be same as shown for Compact Arrangement.

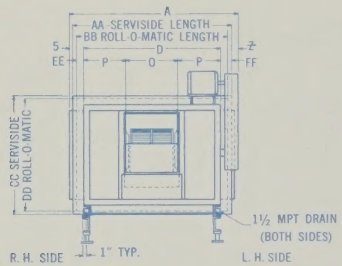
SIZES 4, 9, 15, 18, 22 & 25

Unit Size	A	B	C	D	E	H	J	K	M	S	T	U	V	W	X	Z	AA	BB	CC	DD	EE	FF	GG	HH	JJ
4	53	155⅛	32½	42	25½	38	31½	25½	See Adjacent Table	4	30	1¼	1⅜	5½	14½	6	44	44	28	28¼	1	1	20	36	179⅛
9	59	163⅛	42½	48	34½	44	34½	26		5	34½	2¾	1 3/16	10⅞	12¾	6	56	60	40	36⅛	6	4	32	48	187⅛
15	94	163⅛	42½	82	34½	78	34½	26		5	34½	2¾	1 3/16	10⅞	12¾	7	92	84	40	36⅛	1	5	32	84	187⅛
18	74	186⅝	59½	62	50½	58	43½	37½		6	37½	2¾	—	15⅞	18¾	7	68	64	56	50½	1	3	48	60	210⅝
22	88	186⅝	59½	76	50½	72	43½	37½		6	37½	2¾	—	15⅞	18¾	7	80	84	56	50½	4	2	48	72	210⅝
25	94	196⅛	64	82	55	78	43½	41		6	43½	½	—	15⅛	24¼	7	92	92	56	55	5	5	48	84	220⅛

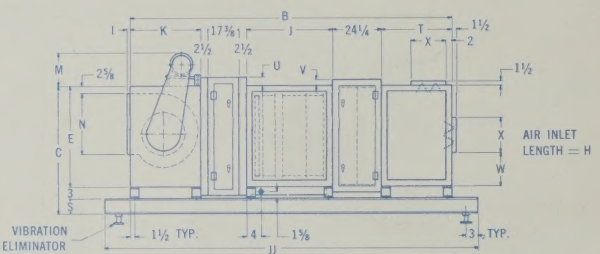
Motor HP	M
1½	14
2	16
3	16
5	17
7½	19
10	21
15	21
20	21

All dimensions in inches. Dimensions subject to change. Certified Drawings furnished upon request.

COMPACT ARRANGEMENT

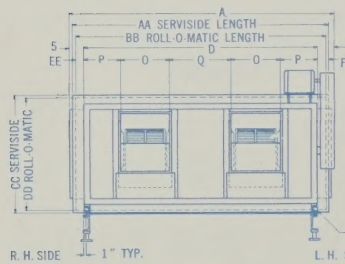


FRONT VIEW

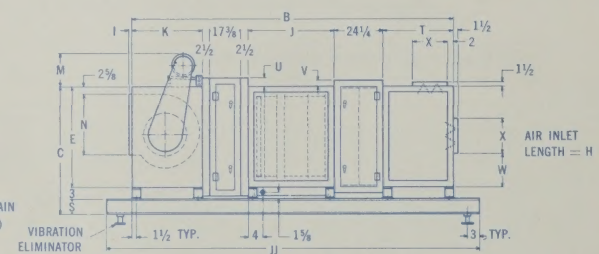


SIDE ELEVATION

SIZES 4, 9, 18, 22 & 25



FRONT VIEW



SIDE ELEVATION

SIZE 15

Unit Size	A	B	C	D	E	H	J	K	M	N	O	P	Q	S	T	U	V	W	X	Z	AA	BB	CC	DD	EE	FF	JJ
4	53	133⅝	32½	42	25½	38	31½	25½	See Adjacent Table	13¼	10⅝	15⅝	—	4	30	1¼	1⅜	5½	14½	6	44	44	28	28¼	1	1	157⅝
9	59	141⅜	42½	48	34½	44	34½	26		21	14¾	16⅝	—	5	34½	2¾	1 3/16	10⅞	12¾	6	56	60	40	36⅛	6	4	165⅝
15	94	141⅜	42½	82	34½	78	34½	26		21	14¾	14	24½	5	34½	2¾	1 3/16	10⅞	12¾	7	92	84	40	36⅛	1	5	165⅝
18	74	165⅛	59½	62	50½	58	43½	37½		27¾	28¾	16⅝	—	6	37½	2¾	—	15⅞	18¾	7	68	64	56	50½	1	3	189⅛
22	88	165⅛	59½	76	50½	72	43½	37½		30⅞	31½	22¼	—	6	37½	2¾	—	15⅞	18¾	7	80	84	56	50½	4	2	189⅛
25	94	174⅝	64	82	55	78	43½	41		30⅞	31½	25¼	—	6	43½	½	—	15⅛	24¼	7	92	92	56	55	5	5	198⅝

Motor HP	M
1½	14
2	16
3	16
5	17
7½	19
10	21
15	21
20	21

All dimensions in inches. Dimensions subject to change. Certified Drawings furnished upon request.

Since "Better Air is our Business," American Air Filter Company has a policy of continuous product research and improvement and reserves the right to change design and specifications without notice.

Bul. RX100 - 5M - 11/71 - CPS

Litho U.S.A.

AVERY CLASSICS AT 255 A35 1973